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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/032,649	10/26/2001	Paul S. Weiss	P05396US1	6169

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EXAMINER

SAGAR, KRIPA

ART UNIT

PAPER NUMBER

1756

DATE MAILED: 05/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

10/032,649

Applicant(s)

WEISS ET AL.

Examiner

Kripa Sagar

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-- The MAILING DATE of this communication appears in the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 March 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-59,69 and 70 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-59,69 and 70 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. The amendment filed 3/12/03 has been entered. Claims 8,20 have been entered; no new matter has been added. Claims 1-59, 69-70 are under consideration.

Election/Restrictions

2. Applicant's election of Group I claims 1-59, 69-70 without traverse is recorded. Claims 60-68 have been withdrawn from consideration.

Claim Rejections - 35 USC § 112

3. Claim rejections under 35USC 112 are withdrawn in view of the amendment and Applicant's explanation of the term "projection".

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by US Pat. 5580697 to Keana et al.

The invention discloses a method of functionalizing a layer of molecules in a defined pattern and making it amenable to react with another functional group in the patterned area or the unpatterned area or both areas. Diverse patterning techniques are claimed.

The claim recites (at least) partially covering a substrate with a layer of molecules and reacting at least one internal bond in the molecule to form a functional group.

Keana teaches that chemical modification of substrate surfaces is known in prior art and generally involves two steps (1;20 – 2; 18). The improvement includes one step modification of a surface by providing reaction-energy to the molecules on the surface of a substrate and a reactant that modifies the molecules to form a second functional group. The second functional group is receptive to other reagents (2;21 – 3;62).

Claims 1, 54-59 and 69-70 are rejected under 35 U.S.C. 102(b) as being anticipated by US Pat. 6436615 to Brandow et al.

Claims 54-59, 69-70 disclose nanolithographic patterning of a molecular layer.

Brandow teaches that “surface reactivity templates” are known in prior-art (1;31-56). Brandow’s invention comprises providing a functional group on a substrate surface, exposing parts of the surface to actinic radiation to convert the exposed regions to photoproducts; the photoproducts are reactive to other functional groups (1;67 – 2;25). Brandow discloses patterning of molecular layers (Fig.1-3) that include positive and negative tone patterns. In one embodiment the reaction of the first functional group forms a second functional group (Fig.2A)

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 2 – 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brandow in view of Keana and further in view of the non-patent publication of Nyffenegger and co-worker ("Scanning Probe Microscope", Chem. Rev. v97(4),(1997), pp.1195-1230).

The claims recite methods of forming the patterned layers using scanning probes and diverse energy sources, the substrates used as supports for the layers and the nature of the layers.

In additions to the teachings discussed above, Brandow teaches selective modification of a *surface* or a *thin film* covering the surface. The modification is a *chemical reaction* of the molecules on the surface, by *irradiation*. The process *may* include a *mask* or *direct writing* may be used. The irradiation may be carried out using *UV light*, *ion beam* or *soft X-rays*. (2;50-3;4). Other sources such as *electron beams* are also viable (4;53-61). Direct chemical reaction is also known (3;19-27). Substrates such as *glass* (fused SiO₂) and *Si* have been used for support (12;29-31). Scanning Tunneling (STM) and Atomic Force Microscopy (AFM) are used for selective patterning (3;5-32). The molecular layer may be attached to the substrate surface through diverse bonds that include *chemical attachment* and physisorption (3;58-64).

Brandow does not teach the use of scanning probe tools (SPM), thermal imaging, diverse substrates and geometric patterns. It does not specify nanolithography or cross-linking of functional groups.

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Keana teaches diverse *substrates* that may be used for chemical modification (2; 27-35). The molecular layers may be modified by radiation, including electrons, photons and *heat* (2;36-46). The process may use a *mask* or *direct scan* (7;7-29). The process is used to form *geometric patterns* including *stripes* and nano-scale spheres (fig.1,3).

Keana teaches forming functional groups that are *cross-linkable* by photons (20;48-57).

Keana does not teach the use of scanning probes for photon irradiation. This is a well developed art as shown by the review of Nyffenegger. The lithographic application of Near Field Scanning Optical Microscopy (NSOM) is reviewed at length (p. 41) with the teachings of Bottomley particularly relevant to the claims.

It would have been obvious to one of ordinary skill in the art to combine the teachings of Keana and Bottomley with those of Brandow because the Keana's teachings are in an analogous art and it teaches that its methods have wide applicability and can be carried out in a single step (2; 12-18); Bottomley teaches that scanning optical lithography using proximal probes is known in prior art and may be successfully used in patterning very thin films of conventional and unconventional resists (p.41).

Response to Arguments

8. Applicant's arguments have been considered but are not convincing.

Applicant appears to have relied on the abstracts of the cited prior-art references in his arguments.

Referring to Keana's abstract, Applicant concludes that : Keana does not teach "selecting at least one internal bond from the plurality of molecules". It is further argued that Keana's method does not allow for the selection of specific internal bonds.

Applicant goes on to argue that the instant invention allows nanoscale patterning that are chemically and spatially precise which Keana's process does not allow.

Applicant's arguments and interpretation of the term "selecting an internal bond" while interesting, are not persuasive. There is nothing in the disclosure which supports the interpretation offered by the Applicant. Applicant does not disclose how the bond to be reacted is selected. In light of this, selecting an internal bond has been interpreted to mean spatial selection of the molecules or patterning a SAM layer. . The bond to be reacted would depend on the molecule comprising the "plurality of molecules" in the SAM layer. Keana teaches each and every element of claim 1 as shown in the rejection above. This includes forming a film on a substrate comprising functional reagents; providing a reaction energy source to a form a nitrene compound and in a second stage attaching a functional molecule to the surface molecules. The reaction includes breaking of internal bonds and addition of second functional molecules. With reference to the argument regarding precision, Examiner notes that this is not recited in the claim. Further, the patterned images in Fig. 2, 3 attest to the spatial selection and precision of Keana's process.

Examiner agrees that Liu does not teach patterning a SAM layer but forms SAM layers on patterned surfaces.

In arguing against the teachings of Brandow, Applicant states that it does not disclose the step of "selecting at least one internal bond from the plurality of internal molecules" . Brandow teaches all the elements of claim 1 as noted in the rejection above. In addition to the portions of the reference cited in the rejection this may also be

understood from reference to Fig.1 alone. A substrate is covered with a plurality of functionalized molecules of an organosilane in a monolayer; internal bonds of the silane are broken by irradiation in a selective pattern; and another functional molecule is added on the monolayers in a negative tone graft.

Conclusion

9. As understood the invention comprises forming a layer of functionalized molecules; internal bonds of the molecules being selectively broken; substituting with another functional molecule. The art relating to the instant invention is mature. The *disclosure and the claims* are too generic to be unobvious. There is a large volume of prior-art references relating to the formation of SAM layers two of which are listed below. These films are conventionally patterned by proximity probe nanolithography as shown by the review of Nyffenegger et al. Further modification of the patterned or unpatterned regions are also known in the art. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. These do not include the references from related biological and biochemical arts.

US Pat. 4945028 to Ogawa teaches forming a monolayer, patterned irradiation and chemical functionalization with an added layer (Fig. 1-7).

US Pat. 5514501 to Tarlov teaches forming a thiol SAM on Au; selective breakage of internal bonds by patterned irradiation and addition of a second thiol layer to the photoreacted areas. (Fig.1-3)

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

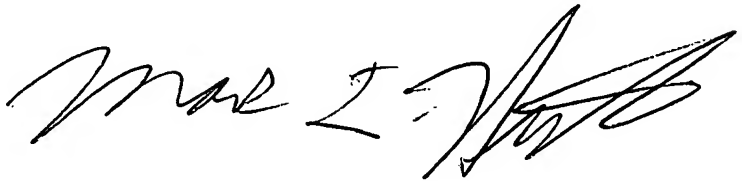
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 703-605-4427. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

A handwritten signature in black ink, appearing to read "Mark F. Huff", with a stylized flourish at the end.

MH/ks
May 22, 2003

MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700